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# Utilization of Plant Waste Bokashi Compost for Urban Organic Melon (*Cucumis melo* L.) Cultivation

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**ABSTRACT**

*Bokashi compost is produced through fermentation of organic wastes in an airtight condition using beneficial microbes. This creates a nutrient-rich pre-compost that can be used to enrich the soil. This study investigated the effect of Bokashi type and fermentation age on the growth and yield of organic melon (Cucumis melo L.). A factorial Completely Randomized Design (CRD) with two factors was employed: Bokashi type (oil palm empty fruit bunches, mahogany leaves, and water guava leaves) and fermentation age (1, 5, and 10 months). The results showed that fermentation age significantly affected all observed variables, while Bokashi type significantly influenced flowering time, fruit weight, and fruit diameter. The highest fruit weight (1521.71 g) and diameter (19.07 cm) were obtained from 10-month fermented Bokashi. Among Bokashi types, water guava leaf Bokashi produced the best yield (979.70 g). These findings indicate that extended fermentation improves nutrient availability and enhances melon productivity under organic cultivation systems.*

## 1. INTRODUCTION

Melon (*Cucumis melo* L.) is an annual fruit crop with high economic value and consumer preference (Trisnawati *et al*., 2018). It contains several essential nutrients beneficial to human health (Ismayani *et al*., 2015). In 100 g of melon flesh, there are 21 kcal, 5.1 g carbohydrates, 0.1 g fat, 0.6 g protein, 15 mg calcium, 34 mg vitamin C, 640 IU vitamin A, 0.03 mg vitamin B1, 0.02 mg vitamin B2, and 94 g water (Amiroh & Rohmad, 2017).

Agricultural development in Indonesia highlights the issue of sustainable farming, which optimally utilizes natural resources without compromising the needs of future generations. Conventional agriculture may provide short-term profit but can cause environmental degradation and reduce land carrying capacity in the long run (Parmila *et al*., 2022). Unlike conventional farming, organic agriculture is a holistic system that supports biodiversity, biological cycles, and soil biological activity. It is based on biological recycling through the use of plant, livestock, and other organic wastes to improve soil fertility and structure (Sutanto, 2002).

Bokashi is an organic fertilizer that can substitute synthetic fertilizers to improve soil fertility while restoring soil properties damaged by excessive inorganic fertilizer use (Tufaila *et al*., 2014). It contains effective soil microorganisms that accelerate organic matter decomposition, thus increasing the availability of N, P, and K for plants (Windi *et al*., 2022). Raw materials used for Bokashi include mahogany leaves (*Swietenia macrophylla*), fallen water guava leaves (*Syzygium aqueum* Burm. f.) and oil palm empty fruit bunches (EFB), all abundantly available daily. Mahogany (*Swietenia macrophylla*) produces up to 2 kg of fallen leaves daily (Pontoh & Siahaan, 2021), with nutrient contents of N = 0.82%, P = 0.03%, and K = 0.32% (Cherbuy *et al*., 2001). Water guava leaves (*Syzygium aqueum* Burm. f.) contain nitrogen, proteins, fats, inorganic minerals, sugars, calcium, iron, magnesium, potassium, zinc, vitamins (C, thiamine, riboflavin, niacin), citric acid, and malic acid (Afidah *et al*., 2018).

Empty oil palm bunches is rich in organic matter, containing N-total (2.10%), $P_2O_5$ (0.76%), $K_2O$ (0.19%), MgO (0.38%), organic C (40.34%), CaO (0.14%) (Lubis *et al*., 2020). Analysis of EFB Bokashi showed N = 1.40%, P = 0.96%, K = 0.41%, organic C = 19.81%, pH = 7.8, and C/N ratio = 14.15 (Sihombing, 2024). Based on 2022 statistics, Bengkulu Province produced 116,581 tons of crude palm oil (CPO), providing abundant EFB waste (BPS, 2024).

Because mahogany leaves, water guava leaves, and EFB have high C/N ratios, Moringa oleifera leaves with low C/N ratios (10–20) are used as a mixture to accelerate fermentation (Palm *et al*., 2001). Moringa is a tree with small rounded leaves, known for multiple health benefits. Mixing Moringa (*Moringa oleifera*) with high C/N organic materials helps balance the ratio and accelerates decomposition. Previous research Nurlianti *et al*. (2023) found that combining Moringa, biochar, and cow manure significantly enhanced the growth of moringa seedlings.

The fermentation time for Bokashi from plant waste generally ranges from 7 to 14 days. However, several studies indicate that optimal results can be achieved in 21–35 days for more mature nutrient quality (N, P, K). This process can be accelerated using bioactivators such as EM4. The longer the fermentation period, the better the chemical quality (N, P, K, C/N ratio, and pH) of the Bokashi fertilizer. For solid cow manure, the best fermentation occurred at 35 days (Tallo & Sio, 2019). Research reported by Prasetio (2022) found that the application of pineapple peel Bokashi and lamtoro leaf organic fertilizer (POC) had no significant effect on all observed parameters on melon growth and yield in the control treatment without Bokashi, ranging from 5 tons per hectare to 10 tons per hectare. It is suspected that extending the Bokashi fermentation period could provide sufficient nutrients for melon plants. No research has reported a fermentation period of up to 10 months; only fermentation periods of less than 2 months. Previous studies have primarily focused on short fermentation periods (≤2 months), while limited research has evaluated long-term fermentation effects (>5 months). Therefore, this study addresses this gap by investigating extended fermentation durations up to 10 months.

This study aims to assess the fermentation period over a longer period of 1–10 months, allowing for more complete decomposition of plant material with a high cellulose content and availability for melon plants. Extended fermentation was hypothesized to improve nutrient maturity and reduce phytotoxic compounds, particularly in high-lignin materials such as EFB and mahogany leaves. The research is expected to demonstrate that organically cultivated melons, without the use of inorganic fertilizers, can reduce farming costs, are healthier for consumption, and are better for the environment. This study is among the first to evaluate extended Bokashi fermentation periods of up to 10 months, providing new insights into long-term organic fertilizer maturation and its impact on crop productivity.

## 2. MATERIALS AND METHODS

This research was conducted from Maret 2025 to May 2025 at Griya Asri, RT.23, Surabaya Village, Sungai Serut Sub-district, Bengkulu City, Bengkulu Province. The materials used in this study were melon seeds of the New Alya F1 variety, Bokashi from oil palm empty fruit bunches (EFB) mixed with Moringa leaves, Bokashi from mahogany leaves mixed with Moringa leaves, and Bokashi from water guava leaves mixed with Moringa leaves. The Bokashi was prepared with three fermentation ages: 10 months, 5 months, and 1 month. Additional materials included topsoil, river sand, and water. The equipment used in this study included polybags (50 cm × 50 cm) for planting media, seedling trays for germination, watering cans for irrigation, a digital weighing scale for measuring fresh and dry biomass, and an electric oven for determining plant dry weight.

A factorial Completely Randomized Design (CRD) was used with two factors: Factor I (Bokashi type): M1: Bokashi of oil palm EFB + Moringa leaves. M2: Bokashi of mahogany leaves + Moringa leaves, M3: Bokashi of water guava leaves + Moringa leaves. Factor II (Bokashi fermentation age): B1: 10 months, B2: 5 months, B3: 1 month. Each treatment combination was replicated three times, and each experimental unit consisted of five plants. Observations were carried out on three sample plants per treatment. The data were analyzed using Analysis of Variance (ANOVA). If significant differences were found, further analysis was conducted using Duncan's Multiple Range Test (DMRT) at a 5% significance level.

### 2.1. Observed Variables

The observed variables consisted of growth and yield parameters, including plant height (cm), number of leaves (leaves), flowering age (days), harvest age (days), fruit weight (g), fruit diameter (cm), fresh biomass (g), and dry biomass (g).

## 2.2. Research Procedures

The research procedure consisted of two main activities: (1) Bokashi preparation (Figure 1), and (2) application of Bokashi type and age in organic melon cultivation (Figure 2).

**Bokashi Preparation**

Each Bokashi type was prepared separately based on its primary raw material:

- M1: oil palm empty fruit bunches (EFB)
- M2: mahogany leaves
- M3: water guava leaves

Each type was mixed with supporting materials consisting of rice husks (2 parts), moringa leaves (1 part), and rice bran (1 part). No mixing between different primary raw materials was conducted to maintain treatment integrity.

⇩

Each type of Bokashi (M1, M2, M3) was composed of the same proportions: six parts main raw material, two parts rice husks, one-part moringa leaves, and one part rice bran (measured by volume using buckets). The fermentation solution consisted of 100 ml EM-4, 10 tablespoons of sugar, and water as needed. All mixtures were fermented according to the designated fermentation ages (1, 5, or 10 months).

⇩

**Bokashi Fermentation Age**

The fermentation age consisted of three levels: 10 months (B1), 5 months (B2), and 1 month (B3) prior to application, resulting in 9 different combinations of Bokashi types and fermentation ages. The average temperature was 25°C, humidity was 30%, and pH was 7.5.

Figure 1. Steps to prepare Bokashi compost

**Melon Seed Preparation**

Melon seeds were soaked in warm water for 2 hours, drained, wrapped in moist tissue, and placed in germination trays.

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**Seedling**

Seedling media consisted of burnt soil and husk charcoal in a 1:1 ratio. The media were placed in seedling trays, holes were made, and the seeds were sown. Seedlings were maintained for 14 days until they had 3–6 leaves.

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**Planting Media Preparation and Fertilization**

The planting medium consisted of topsoil, which was characterized by a red-yellow color, low fertility, and acidic pH, river sand, and Bokashi in a 1:1:1 ratio. The medium was mixed thoroughly and placed into 10 kg polybags (135 polybags in total).

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**Transplanting**

After 14 days in the nursery, seedlings were transplanted into polybags (one plant per polybag) and watered immediately to maintain soil moisture

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**Plant Maintenance**

Staking: Stakes (1.5 m) were installed, and stems were tied once the plants had 5 leaves.
Watering was carried out twice daily, at 7:00 a.m. and 5:00 p.m.
Replanting: Replacement of dead plants with same-aged seedlings.
Weeding: Weeds were manually removed.
Pruning: Performed on side branches except between the 7$^{th}$ and 12$^{th}$ nodes.
Topping: Carried out at the 33$^{rd}$ node.
Pest and Disease Control: Conducted manually.

⇩

**Melon Fruit Selection**

Only two perfectly round fruits per plant were maintained.

⇩

**Harvesting**

Melons were harvested approximately 70 days after transplanting. Maturity indicators included a yellowish-white rind, cracks forming around the fruit stalk, and a fragrant aroma. Harvesting was done by cutting the stalk, leaving 2 cm to extend shelf life.

Figure 2. Steps to apply Bokashi compost for melon plant

## 3. RESULTS AND DISCUSSION

Based on the observations conducted during the study, the results of the ANOVA are summarized in Table 1. The results indicate that Bokashi type significantly affected the variables of days to flowering, fruit weight, and fruit diameter.

Meanwhile, Bokashi fermentation age had a highly significant effect on all observed variables. Interactions between Bokashi type and fermentation age, however, showed no significant effect across most parameters.

Table 1. *F*-values resulted from ANOVA on the effect of Bokashi type and fermentation age on the growth and yield of melon plants

| Variable | Bokashi Type (M) | Bokashi Age (B) | Interaction (MB) |
|---|---|---|---|
| Plant height 1 WAP | 0.10 ns | 59.85 ** | 1.34 ns |
| Plant height 2 WAP | 3.49 ns | 29.21 ** | 0.42 ns |
| Plant height 3 WAP | 2.09 ns | 164.71 ** | 1.25 ns |
| Plant height 4 WAP | 3.53 ns | 50.27 ** | 1.56 ns |
| Plant height 5 WAP | 2.40 ns | 25.16 ** | 0.78 ns |
| Number of leaves 1 WAP | 1.37 ns | 6.31 ** | 1.02 ns |
| Number of leaves 2 WAP | 2.29 ns | 35.75 ** | 2.30 ns |
| Number of leaves 3 WAP | 0.76 ns | 34.83 ** | 2.09 ns |
| Number of leaves 4 WAP | 2.68 ns | 23.17 ** | 2.28 ns |
| Number of leaves 5 WAP | 2.80 ns | 51.44 ** | 2.88 ns |
| Days to flowering | 4.64 * | 16.49 ** | 1.95 ns |
| Days to harvest | 2.77 ns | 63.62 ** | 2.70 ns |
| Fruit weight | 48.69 ** | 2385.22 ** | 2.47 ns |
| Fruit diameter | 86.69 ** | 2504.89 ** | 2.22 ns |
| Fresh biomass | 2.70 ns | 6.34 ** | 0.47 ns |
| *F* table 5% | 3.55 | 3.55 | 2.93 |
| *F* table 1 % | 6.01 | 5.53 | 4.58 |

Notes= ns: not significant, *: significant, **: highly significant, WAP: weeks after planting

The ANOVA results showed that Bokashi fermentation age had a highly significant effect on plant height at 1 week after planting (WAP) 59.85**, 2 WAP 29.21**, 3 WAP 164.71**, 4 WAP 50.27**, 5 WAP 25.16**. In contrast, the interaction between Bokashi type and fermentation age had no significant effect on melon plant height. The results of the DMRT post hoc test at the 5% significance level are presented in Table 2.

Based on Table 2, it was found that Bokashi fermented for 10 months had a greater effect compared to Bokashi fermented for 5 months and 1 month. At 5 weeks after planting (WAP), plant height reached an average of 172.63 cm with 10-month Bokashi, while 5-month and 1-month Bokashi produced average heights of 160.60 cm and 155.53 cm, respectively. In addition, prolonged fermentation likely reduced phytotoxic compounds and stabilized organic matter, thereby enhancing root nutrient uptake efficiency and supporting optimal plant physiological processes. Tallo & Sio (2019) reported that prolonged Bokashi fermentation can enrich nutrient content.

The ANOVA results further indicated that Bokashi type had no significant effect on leaf number from 1–5 WAP, while Bokashi fermentation age had a highly significant effect. The interaction between Bokashi type and fermentation age did not significantly affect the number of leaves in melon plants. The results of the DMRT post hoc test at the 5% significance level are presented in Table 3. Bokashi fermented for 10 months produced a greater number of leaves compared to 5-month and 1-month Bokashi. At 5 weeks after planting (WAP), melon plants fertilized with 10-month Bokashi had an average of 28.18 leaves, while those treated with 5-month and 1-month Bokashi produced 26.48 and 25.96 leaves, respectively. Bernal *et al*. (2009) stated that a longer fermentation process can improve the stability of organic matter and enhance the availability of nutrients for plants. Bokashi fermented for 10 months was able to supply nutrients that could be absorbed by plants from 1 WAP up to 5 WAP.

Table 2. Effect of Bokashi age on plant height average (cm)

| Bokashi Age | Plant Height average (cm) | | | | |
|---|---|---|---|---|---|
| | 1 WAP | 2 WAP | 3 WAP | 4 WAP | 5 WAP |
| B1 (10 months) | 5.73 c | 16.73 c | 65.46 c | 111.59 c | 172.63 b |
| B2 (5 months) | 5.57 b | 15.14 b | 53.08 b | 97.11 b | 160.60 a |
| B3 (1 month) | 5.11 a | 14.19 a | 45.92 a | 90.82 a | 155.53 a |

Note: Numbers followed by the same letter in the same column are not significantly different at the 5% level according to DMRT.

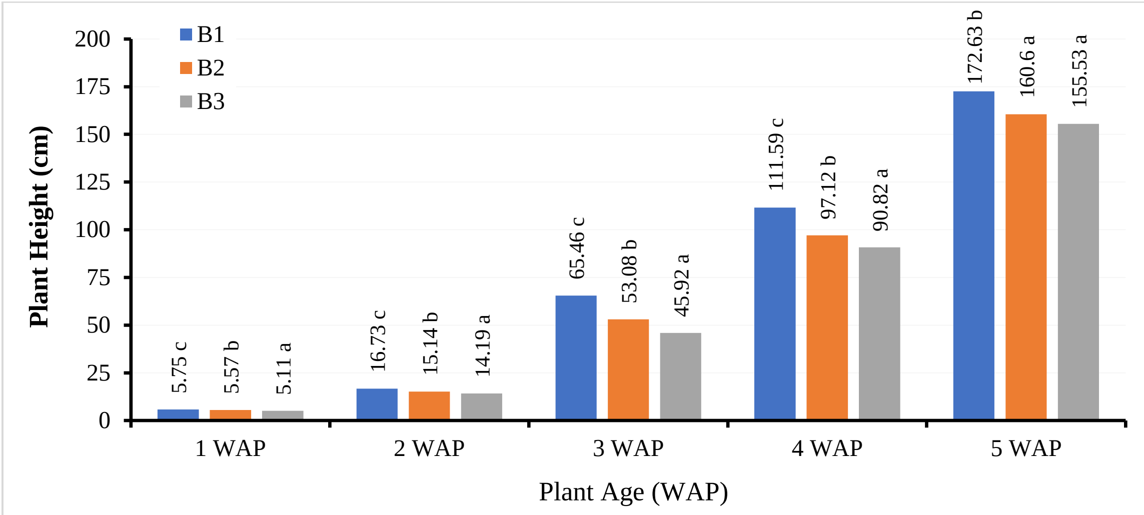


Figure 1. Effect of Bokashi age on plant height (cm) of melon

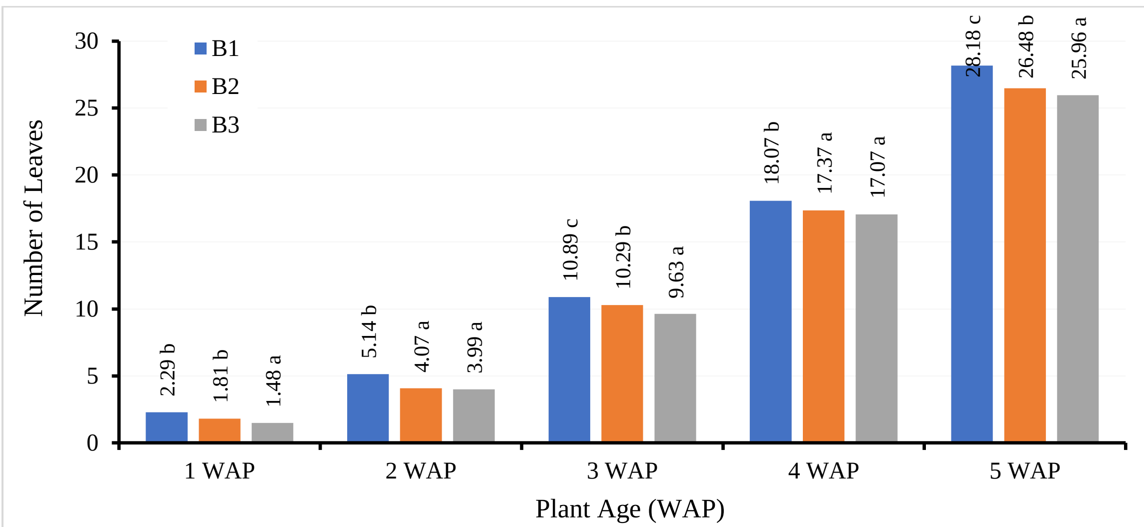


Figure 2. Effect of Bokashi age on the number of leaves (leaves) of melon plant

Table 3. Effect of Bokashi age on the number of leaves (leaves) average

| Bokashi Age | Number of Leaves average | | | | |
|---|---|---|---|---|---|
| | 1 WAP | 2 WAP | 3 WAP | 4 WAP | 5 WAP |
| B1 (10 months) | 2.29 b | 5.18 b | 10.89 c | 18.07 b | 28.18 c |
| B2 (5 months) | 1.81 b | 4.07 a | 10.29 b | 17.37 a | 26.48 b |
| B3 (1 month) | 1.48 a | 3.99 a | 9.63 a | 17.07 a | 25.96 a |

Note: Numbers followed by the same letter in the same column are not significantly different at the 5% level according to DMRT.

Observations of leaf number and plant height revealed a clear pattern showing that 10-month Bokashi supported better vegetative growth of melon plants compared to 5-month and 1-month Bokashi. This indicates that 10-month Bokashi could already provide sufficient nutrients for vegetative growth from the early stages up to 5 WAP, meaning that it has the potential to substitute for inorganic fertilizers in supporting vegetative growth of melon plants (Tufaila *et al*., 2014).

The ANOVA results also showed that Bokashi type had a significant effect (4.61*), while Bokashi fermentation age had a highly significant effect (16.49**) on days to flowering. The results of the DMRT post hoc test at the 5% significance level are presented in Table 4.

Table 4. Effect of Bokashi type and age on days to flowering (days)

| Bokashi Type | Bokashi Age | | | |
|---|---|---|---|---|
| | **B1 (10 months)** | **B2 (5 months)** | **B3 (1 month)** | **Average** |
| M1 (EFB + moringa leaves) | 20.66 | 20.89 | 22.00 | 21.18 b |
| M2 (mahogany leaves + moringa leaves) | 20.89 | 21.77 | 21.66 | 21.44 b |
| M3 (water guava leaves + moringa leaves) | 20.22 | 20.55 | 21.66 | 20.81 a |
| Average | 20.59 a | 21.07 b | 21.77 c | |

Note: Numbers followed by the same letter in the same column and row are not significantly different at the 5% level according to DMRT.

Based on Table 4, it was observed that water guava leaf Bokashi accelerated flowering compared to mahogany leaf Bokashi and oil palm empty fruit bunch (EFB) Bokashi. The best result was obtained with M3, with an average of 20.81 days to flowering. According to Fengel & Wegener (1995), broadleaf (hardwood) plants generally contain high levels of cellulose (approximately 45%) and low levels of lignin (approximately 20%). Water guava (*Syzygium aqueum*), being a broadleaf species, has low lignin and high cellulose content, which allows it to decompose more quickly. The faster organic matter decomposes, the sooner essential nutrients become available for plants. The rapid availability of nutrients supports earlier initiation of the generative phase, as indicated by the earlier flowering of melon plants.

Similarly, Bokashi fermented for 10 months (B1) resulted in earlier flowering compared to those of 5-month (B2) and 1-month (B3) Bokashi. The best flowering response was obtained with B1, which averaged 20.59 days. According to the varietal description of New Alya, flowering normally occurs at 23–26 days. Thus, the use of 10-month Bokashi accelerated flowering by about 3 days compared to the standard. This suggests that melon plants were able to meet their nutrient requirements from the early growth stage, preventing disruptions in vegetative development. Insani *et al*. (2021) also reported that inhibited vegetative growth in chili plants significantly affected the initiation of flower buds.

The ANOVA results further showed that Bokashi type had no significant effect on harvest time, whereas Bokashi fermentation age had a highly significant effect (63.62**). The interaction between Bokashi type and age was not significant for melon harvest time. The results of the DMRT post hoc test at the 5% significance level are presented in the following table.

Based on Table 5, it was observed that Bokashi fermented for 10 months resulted in earlier harvest compared to 5-month and 1-month Bokashi. The best harvest time was obtained with B1 (10-month Bokashi), with an average of 62.70 days. According to the varietal description of New Alya melon, the harvest period ranges from 62 to 74 days. This means that the use of 10-month Bokashi is highly recommended, as it enables harvesting at 62.7 days, earlier than the upper limit of the varietal standard.

Table 5. Effect of Bokashi type and age on the average of harvest age (days)

| Bokashi Type | Bokashi Age | | | |
|---|---|---|---|---|
| | **B1 (10 months)** | **B2 (5 months)** | **B3 (1 month)** | **Average** |
| M1 (EFB + moringa leaves) | 63.11 | 64.00 | 65.55 | 64.22 a |
| M2 (mahogany leaves + moringa leaves) | 63.00 | 63.78 | 65.44 | 64.08 a |
| M3 (water guava leaves + moringa leaves) | 62.00 | 64.33 | 64,78 | 63.70 a |
| Average | 62.70 a | 64.04 b | 65.26 c | |

Note: Numbers followed by the same letter in the same column and row are not significantly different at the 5% level according to DMRT.

The ANOVA results also showed that Bokashi type had a highly significant effect on fruit weight (48.69**), while Bokashi fermentation age also had a highly significant effect (2385.22**). However, the interaction between Bokashi type and fermentation age was not significant. The results of the DMRT post hoc test at the 5% significance level are presented in Table 6.

Table 6. Effect of Bokashi type and age on fruit weight average (g)

| Bokashi Type | Bokashi Age | | | |
|---|---|---|---|---|
| | **B1 (10 months)** | **B2 (5 months)** | **B3 (1 month)** | **Average** |
| M1 (EFB + moringa leaves) | 1413.12 | 711.99 | 325.86 | 816.99 a |
| M2 (mahogany leaves + moringa leaves) | 1513.61 | 752.99 | 354.77 | 873.79 b |
| M3 (water guava leaves + moringa leaves) | 1638.41 | 818.62 | 482.06 | 979.70 c |
| Average | 1521.71 c | 761.20 b | 387.56 a | |

Note: Numbers followed by the same letter in the same column are not significantly different at the 5% level according to DMRT.

Based on Table 6, it was observed that water guava leaf Bokashi exhibited superior performance compared to mahogany leaf Bokashi and oil palm empty fruit bunch (EFB) Bokashi. The best fruit weight was obtained with M3 (water guava leaf Bokashi), with an average of 979.70 g. Laboratory analysis of the planting media at the Agricultural Instrument Standardization Application Center (BPSIP) Bengkulu showed that phosphorus and potassium levels in water guava leaf Bokashi were higher than those in mahogany leaf Bokashi and EFB Bokashi. At 10 months of fermentation, P and K contents in water guava leaf Bokashi were 40.87 ppm and 0.43 cmol/kg, respectively, compared to EFB Bokashi (19.72 ppm and 0.34 cmol/kg) and mahogany leaf Bokashi (24.08 ppm and 0.19 cmol/kg).

Mahogany leaves and oil palm EFB are plant parts with high lignin content, making them difficult for microorganisms to decompose. Rahman *et al.* (2013) stated that lignin is one of the slowest-decomposing components, which can negatively affect plant growth and yield. This explains why the best fruit weight was obtained from M3 (water guava leaf Bokashi), with an average of 979.70 g.

In terms of fermentation age, 10-month Bokashi provided superior results compared to 5-month and 1-month Bokashi. The best fruit weight was obtained with B1 (10-month Bokashi), with an average of 1521.71 g. The P and K contents in water guava leaf Bokashi at 10 months were 40.87 ppm and 0.43 cmol/kg, respectively. In comparison, the same Bokashi at 5 months contained 25.02 ppm P and 0.33 cmol/kg K, while at 1 month it contained 23.19 ppm P and 0.35 cmol/kg K. These results clearly show that nutrient (P and K) content was much higher in 10-month water guava leaf Bokashi compared to shorter fermentation ages, which directly contributed to higher fruit weight.

The ANOVA results further revealed that both Bokashi type and fermentation age had a highly significant effect on fruit diameter (86.69** and 2504.89**), while their interaction was not significant. The results of the DMRT post hoc test at the 5% significance level are presented in Table 7. It was found that water guava leaf Bokashi produced larger fruit diameters compared to mahogany leaf Bokashi and oil palm empty fruit bunch (EFB) Bokashi. The largest average fruit diameter obtained with water guava leaf Bokashi was 13.38 cm. When compared with the varietal description of New Alya (13.97–15.93 cm), the diameter achieved using water guava leaf Bokashi was at the lower limit (13.38 cm). Nevertheless, under organic cultivation conditions, this result is considered very good as it nearly matches the varietal description.

Meanwhile, Bokashi fermented for 10 months produced the largest average fruit diameter, reaching 19.07 cm, which even exceeded the maximum value described for the New Alya variety (15.93 cm). The superior performance of 10-month fermented Bokashi can be attributed to enhanced microbial decomposition, which reduces complex organic compounds such as lignin and cellulose into more bioavailable forms. This process increases nutrient mineralization, particularly phosphorus and potassium, which are essential for fruit development. Consequently, plants treated with longer-fermented Bokashi exhibited improved nutrient uptake efficiency, leading to higher fruit weight and diameter.

Table 7. Effect Bokashi type and age on fruit diameter average (cm)

| Bokashi Type | Bokashi Age | | | |
|---|---|---|---|---|
| | **B1 (10 months)** | **B2 (5 months)** | **B3 (1 month)** | **Average** |
| M1 (EFB + moringa leaves) | 18.09 | 9.52 | 5.48 | 11.03 a |
| M2 (mahogany leaves + moringa leaves) | 19.11 | 10.24 | 6.59 | 11.98 b |
| M3 (water guava leaves + moringa leaves) | 20.00 | 12.34 | 7.79 | 13.38 c |
| Average | 19.07 c | 10.70 b | 6.62 a | |

Note: Numbers followed by the same letter in the same column or row are not significantly different at the 5% level according to DMRT.

The ANOVA results also showed that Bokashi type had no significant effect on fresh and dry biomass of melon plants. In contrast, Bokashi fermentation age had a highly significant effect on both fresh and dry biomass. The interaction between Bokashi type and fermentation age was not significant. The results of the DMRT post hoc test at the 5% significance level are presented in Table 8.

Table 8. Effect of Bokashi type and age on fresh biomass weight of melon plant (g)

| Bokashi Type | Bokashi Age | | | |
|---|---|---|---|---|
| | B1 (10 months) | B2 (5 months) | B3 (1 month) | Average |
| M1 (EFB + moringa leaves) | 667.69 | 543.37 | 533.24 | 581.43 a |
| M2 (mahogany leaves + moringa leaves) | 653.90 | 563.53 | 551.92 | 589.74 a |
| M3 (water guava leaves + moringa leaves) | 674.01 | 631.84 | 626.69 | 644.18 ab |
| Average | 665.20 a | 579.60 b | 570.62 b | |

Note: Numbers followed by the same letter in the same column and row are not significantly different at the 5% level according to DMRT.

Table 9. Effect of Bokashi type and age on dry biomass weight of melon plant (g)

| Bokashi Type | Bokashi Age | | | |
|---|---|---|---|---|
| | B1 (10 months) | B2 (5 months) | B3 (1 month) | Average |
| M1 (EFB + moringa leaves) | 131.55 | 129.16 | 127.82 | 129.51 a |
| M2 (mahogany leaves + moringa leaves) | 132.17 | 130.18 | 130.10 | 130.82 a |
| M3 (water guava leaves + moringa leaves) | 133.03 | 130.40 | 130.30 | 131.27 a |
| Average | 132.00 a | 130.40 b | 129.41 b | |

Note: Numbers followed by the same letter in the same column and row are not significantly different at the 5% level according to DMRT.

Mukaromah *et al.* (2017) reported that allelopathic compounds from mahogany leaves are not completely degraded even after 8–10 months of composting and thus may still inhibit plant growth. In this study, 10-month Bokashi provided better effects compared to 5-month and 1-month Bokashi. Bokashi fermented for 10 months contained richer nutrient levels than Bokashi with shorter fermentation periods, such as 5 months and 1 month. Longer fermentation allows microorganisms to decompose organic matter more thoroughly, resulting in higher nutrient content and more optimal nutrient availability. Tallo & Sio (2019) also stated that extended Bokashi fermentation can enrich nutrient content.

Over time, the compounds formed during fermentation become more easily absorbed by plants, making 10-month Bokashi a superior option for supporting soil fertility and plant growth. Bernal *et al.* (2009) further explained that prolonged fermentation enhances the stability of organic matter and increases the availability of nutrients for plants. These findings are consistent with nutrient mineralization theory, which suggests that prolonged decomposition enhances nutrient bioavailability and improves plant uptake efficiency.

## 4. CONCLUSIONS AND RECOMMENDATIONS

The results of this study indicate that the age of Bokashi fermentation significantly influenced the growth and yield of melon (*Cucumis melo* L.) across all observed variables. The type of Bokashi significantly affected the number of days to flowering, fruit weight, and fruit diameter. The application of 10-month fermented water guava leaf Bokashi is recommended as an effective organic fertilization strategy to enhance melon productivity. The melon plants treated with water guava leaf Bokashi (M3) weighed 979.70 g and had a fruit diameter of 13.38 cm, which was higher than the weight of melon plants treated with Bokashi and empty oil palm bunches, which was 816.7 g and a fruit diameter of 11.03 cm. The 10-month-old Bokashi treatment (B1) separately without interaction showed the best growth and yield of organic melon compared to the other treatments. The melon fruit treated with Bokashi, and water guava leaves yielded the highest fruit weight, at 1521.71 g, with a fruit diameter of 19.07 cm, compared to the treatment treated with Bokashi and empty oil palm bunches, which only weighed 387.56 g and a fruit diameter of 6.62 cm. This study provides practical implications for sustainable agriculture by demonstrating that long-term Bokashi fermentation can serve as an effective alternative to inorganic fertilizers in improving crop productivity. Further research on agricultural land is needed. This study was conducted under controlled polybag conditions; therefore, field-scale validation is required.

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## AUTHOR CONTRIBUTION STATEMENT

| Author | C | M | So | Va | Fo | I | R | D | O | E | Vi | Su | P | Fu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nurs | ✓ | ✓ | | ✓ | | | | | ✓ | ✓ | | ✓ | | |
| Nurl | ✓ | | ✓ | | | | | ✓ | | ✓ | ✓ | | | |
| SYR | ✓ | ✓ | | | | ✓ | | ✓ | | | | | | |
| Pri | ✓ | | | | | ✓ | ✓ | | ✓ | | | | ✓ | ✓ |
| FA | ✓ | | | | | | ✓ | | | | | | | |

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|---|---|---|---|
| C: Conceptualization | Fo: Formal Analysis | O: Writing - Original Draft | Fu: Funding Acquisition |
| M: Methodology | I: Investigation | E: Writing - Review & Editing | P: Project Administration |
| So: Software | D: Data Curation | Vi: Visualization | |
| Va: Validation | R: Resources | Su: Supervision | |

## REFERENCES

Afidah, Y., Zuhro, F., Hasanah, H.U., Winarso, S., & Hoesain, M. (2018). Pengaruh waktu pemberian pupuk kandang terhadap pertumbuhan vegetatif tabulampot jambu air MDH (*Syzygium samarangense* (Blume) Merr. & L. M. Perry). In *Prosiding Seminar Nasional Edusainstek FMIPA UNIMUS* (pp. 120–127). Universitas Muhammadiyah Semarang.

Amiroh, A., & Rohmad, M. (2017). Kajian varietas dan dosis urine kelinci terhadap pertumbuhan dan produksi tanaman melon (*Cucumis melo* L.). *Jurnal Folium*, ***1***(1).37-47.

Badan Pusat Statistik [BPS]. (2024). *Statistik kelapa sawit Indonesia 2023*. Badan Pusat Statistik.

Bernal, M.P., Alburquerque, J.A., & Moral, R. (2009). Composting of animal manures and chemical criteria for compost maturity assessment. A review. *Bioresource Technology*, ***100***(22), 5444–5453. https://doi.org/10.1016/j.biortech.2008.11.027

Cherbuy, B., Joffre, R., Gillon, D., & Rambal, S. (2001). Internal remobilization of carbohydrates, lipids, nitrogen and phosphorus in the Mediterranean evergreen oak *Quercus ilex*. *Tree physiology*, ***21***(1), 9–17. https://doi.org/10.1093/treephys/21.1.9

Fengel, D., & Wegener, G. (1995). *Kayu: Kimia, ultrastruktur, reaksi-reaksi* (H. Sastrohamidjojo, Penerj.; S. Prawirohatmodjo, Ed.). Yogyakarta: Gadjah Mada University Press.

Insani, N.N., Darmanti, S., & Saptiningsih, E. (2021). Pengaruh durasi penggenangan terhadap pertumbuhan vegetatif dan waktu berbunga cabai merah keriting *Capsicum annum* (L.) varietas jacko. *Buletin Anatomi dan Fisiologi*, ***6***(2), 104-114. https://doi.org/10.14710/baf.6.2.2021.104-114

Ismayani, R.F., Notarianto, & Sholihah, S.M. (2015). Pengaruh dosis pupuk organik puyuh terhadap pertumbuhan dan hasil tanaman melon (*Cucumis melo* L). *Jurnal Ilmiah Respati*, ***6***(1).480-486

Lubis, R., Nasution, R., & Ginting, A. (2020). Pemberian pupuk organik cair tandan kosong kelapa sawit terhadap sifat kimia tanah dan pertumbuhan tanaman jagung. *Jurnal Agroteknologi*, ***8***(3), 112–120.

Mukaromah, A.S., Purwestri, Y.A., & Fujii, Y. (2017). Determination of allelopathic potential in mahogany (*Swietenia macrophylla* King) leaf litter using sandwich method. *Indonesia Jurnal of Biotechnology*, ***21***(2), 93–101. https://doi.org/10.22146/ijbiotech.16456

Nurlianti, N., Nurseha, N., Putra, O.A., Prihanani, P., & Ariyani, F. (2023). Moringa growth response in treatment of Bokashi composition and dosage of moringa leaf (*Moringa oleifera*) using subsoil. *Jurnal Teknik Pertanian Lampung (Journal of Agricultural Engineering)*, ***12***(3), 665–675. https://doi.org/10.23960/jtep-l.v12i3.665-675

Palm, C.A., Gachengo, C.N., Delve, R.J., Cadisch, G., & Giller, K.E. (2001). Organic inputs for soil fertility management in tropical agroecosistems: Aplication of an organic resource database. *Agriculture, Ecosystems and Environment*, ***83***, 27-42. https://doi.org/10.1016/S0167-8809(00)00267-X

Parmila, I.P., Suardike, P., & Prabawa, P.S. (2022). Kajian pertanian organik dalam upaya menyusun kebijakan pembangunan pertanian yang berkelanjutan di Kabupaten Buleleng. *Jurnal Pertanian Agros*, ***24***(3), 1156–1169.

Pontoh, J., & Siahaan, R. (2021). Potensi produksi dan pengumpulan biomasa dari sampah daun di kampus Universitas Sam Ratulangi Kleak Manado dengan kelompok mahasiswa perempuan. *JPAI: Jurnal Perempuan dan Anak Indonesia*, ***2***(2), 24–31. https://doi.org/10.35801/jpai.2.2.2021.32618

Prasetio, D. (2022). Respon pertumbuhan dan hasil tanaman melon (*Cucumis melo* L.) terhadap pemberian Bokashi kulit nenas dan POC daun lamtoro. *Jurnal Ilmiah Mahasiswa Pertanian (JIMTANI)*, ***2***(3), 1–13.

Rahman, M.M., Tsukamoto, J., Rahman, Md.M., Yoneyama, A., & Mostafa, K.M. (2013). Lignin and its effects on litter decomposition in forest ecosystems. *Chemistry and Ecology*, ***29***(6), 540–553. https://doi.org/10.1080/02757540.2013.790380

Sihombing, F.W. (2024). Pengaruh kompos tandan kosong kelapa sawit terhadap beberapa sifat kimia tanah pada bekas tambang batubara dan pertumbuhan tanaman sengon Solomon [*Undergraduated Thesis*]. Universitas Jambi.

Sutanto, R. (2002). *Penerapan pertanian organik: Pemasyarakatan dan pengembangannya*. Yogyakarta: Penerbit Kanisius.

Tallo, M.L.L., & Sio, S. (2019). Pengaruh lama fermentasi terhadap kualitas pupuk Bokashi padat kotoran sapi. *Journal of Animal Science*, ***4***(1), 12–14.

Trisnawati, R., Kesumawati, E., & Hayati, M. (2018). Pertumbuhan dan hasil tanaman melon (*Cucumis melo* L.) pada berbagai tipe media tumbuh dan konsentrasi nutrisi Hydro-J melon dengan hidroponik substrat. *Jurnal Agrista*, ***22***(1), 1–9.

Tufaila, M., Laksana, D.D., & Alam, S. (2014). Aplikasi kompos kotoran ayam untuk meningkatkan hasil tanaman mentimun (*Cucumis sativus* L.) di tanah masam. *Agroteknos*, ***4***(2), 120–127.

Windi, Y., Jawang, U.P., & Ndapamuri, M.H. (2022). The quality test of Bokashi fertilizer: A combination of local ingredients from the leaves of gamal, kirinyuh, and lamtoro plant leaves. *Asian Journal of Healthcare Analytics*, ***1***(2), 119–132. https://doi.org/10.55927/ajha.v1i2.1673